Radio of Today and Tomorrow

by David Sarnoff, General Manager, Radio Corporation of America

Reprinted from the New York Sunday Herald, May 14, 1922

Part 1

All world progress rests upon interchange of intelligence. With the growth and spread of radio, even into isolated communities, humanitarian, educational and social possibilities come into view hitherto envisioned through no other agency. But to approximate the future of radio, we must understand the record of its past.

Radio on the ocean forced its way into popular imagination when the first call of distress was flashed by a wireless operator from a sinking ship.

Radio as a means of international communication already has proved itself not only by service rendered to the general public, but by the service it has rendered to government, to industry and to trade. And now radio in the home is bringing entertainment and instruction to millions of people who are just beginning to glimpse the possibilities of the new art.

But the greater radio, the radio of the future, with its manifold ramifications in the transmission of intelligence is yet faint upon the horizon.

Early History

The origin of radio lies in the experiments of Hertz, a German scientist. At the time of his discovery, he was using among various laboratory devices, an apparatus known as an induction coil - an electrical device which causes a spark. Its operation begins at a low voltage, or electrical pressure which it then steps up to so high a point that the electric discharge or spark flashes across between the spark points. Hertz found in experimenting with the spark coil that he had set into electrical vibration metallic bodies and various electrical devices. Knowing that there was no connection between these and his sending apparatus, he realized that he faced a new phenomenon, and by careful analysis of the effect of the current, he came to the conclusion that "ether," which is supposed to pervade everything, is capable of carrying electric waves (or, as later defined, "electro-magnetic waves"), and that these waves travel outward through the air in all directions.

Marconi's Invention

This discovery was widely published. It meant nothing, at that moment, however, to the general public, or the lay mind - just as the Einstein theory, for example, means very little to us today. Yet, it registered with a deep understanding on the mind of an eighteen year old youth then studying in Italy, Guglielmo Marconi. He reasoned that if it were true that the ether carried these electro-magnetic waves, if by this medium, electric energy could be carried, it would be desirable to break these waves up into a series of dots and dashes corresponding to the Morse alphabet used in ordinary telegraphy. Having done that, the ether could be employed to do the work hitherto done by wire telegraphy.

With this definite objective he began his task. He experimented extensively and found that, in order to send out the electric waves efficiently, it was necessary to connect up an insulated wire suspended in the air with one side of the induction coil - and in this simple form came into being the first type of wireless sending apparatus ever used in the world. A definite return path was desirable for the electrical circuit, so he used the ground; connecting it by wire to the other side of the coil, still utilizing, of course, his connection to an aerial wire (or antenna, as it is technically called). The wires one sees suspended over so many housetops now are these antennas.

Having found the means of sending electro-magnetic waves through the air, the next question was how to receive them. To accomplish this, he developed an instrument known as a coherer, the action of which was very simple. It consisted of a small glass tube within which were a number of filings; a wire from one side connected it to the aerial; another wire from the other side went to the ground, through various coils or other apparatus. When the electro-magnetic wave emitted from the sending station impinged on the receiving aerial, an electric current passed through the little coherer tube and acted upon those metallic filings. Electrically speaking, it changed their resistance. In ordinary language, this means simply that the character of the filings changed; and every time that change took place, something happened; either the telegraph relay closed, or a noise was made in the receiving telephones, or an ink recorder operated. That is, the feeble action on the tiny metallic filings was used to do a specific job - to make intelligible by sound or by a mark the dots and dashes of the telegraph code. This was the original radio system; a transmitting instrument which shot out dots and dashes by breaking up into groups of short and long duration the electro-magnetic waves sent out into the ether. These electrical impulses, travelling through the air found their way to any aerial wire suspended in the air; they would then go through the little coherer device, and be made intelligible either by sound or by a record on paper.

Priniciples of Tuning

The next problem presenting itself was to arrange matters so that if more than one emission of electro-magneitc waves was carrying dots and dashes through the air, the receiving apparatus would not get the conflicting and simultaneous messsages in the form of a jumble of signals; in other words, there arose the problem of interference. The answer to that was, tuning. Implied by that single word are many of the familiar terms appearing in the daily press, such as wave lengths, tuning apparatus and tuning coils, variometers, condensers and many other pieces of electrical apparatus that resolve themselves into associated devices to accomplish the end. Yet the principle of tuning is simple. Consider - by way of analogy - the effect of resonance in music. It is common knowledge, for example, that using a violin, when one string is tuned to a certain pitch and played upon, another string attuned to the same pitch will be set into sympathetic and powerful vibration; that it will of itself respond and give out music, or a single note of music. In music, this effect is known as syntony, or resonance. We call it the same thing in radio. The receiving apparatus is electrically tuned to the sending apparatus, and vice-versa, and a condition of resonance is set up between the two circuits. Only then do we get a marked response.

The electro-magnetic waves of radio travel outward from the transmitter in all directions. To use another simple analogy: When a stone is thrown into the water, an ever-widening series of ripples radiates outward; these waves die out gradually, and the length of them and their character depend upon the size of the stone and the force with which it was thrown. Just so with radio. A stream of electro-magnetic waves is sent out, and its character and its length are regulated by the kind of apparatus used. Travelling in all directions, radio can do that which is possible with no other means of communication; it passes through everything; the message it carries practically cannot be stopped.

So much for the fundamentals of radio communication, which it has been attempted to set down without a bewildering array of technical terms.

Ship To Shore Communication

Quite naturally, radio was first employed in ship to shore traffic, for prior to that time there was no way of communi-

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cating with a moving vessel. Marconi had taken his invention to England, where he had been greatly encouraged by the British Post Office; there had been placed at his disposal every available facility, and a number of tests were made which proved that wireless waves could travel, first, a mile, then five miles, then fifty miles, and so on. Then a ship was equipped with radio apparatus and sent out to sea.

The first American vessel to carry radio was the steamer "Philadelphia" of the American Line, a ship still in existence. The installation comprised the induction coil and the coherer receiving apparatus. Marconi himself made a trip for experimentation; and communication was established with a coastal station erected on shore in England, the ship maintaining contact with the shore, first over a very short distance, and then over increasingly larger distances, until the practicability of this method of communication between ship and shore had been thoroughly demonstrated.

Installations on many ships followed, but the real significance of the invention to the maritime world was not appreciated until it played for the first time a dramatic role in a marine disaster. That was in 1909, when the steamship "Republic" of the White Star Line met in collision an Italian ship, the "Florida," off the "Banks" near Nantucket Island. The crash came in the middle of a dark night. It was then that radio came into its own. When a young wireless operator named Jack Binns pressed his key, and through the agency of radio called for the succor and relief of fifteen hundred human beings on a sinking ship, his signal sent a thrill around the world.

The famous distress call, C Q D then represented the international signal meaning, "I am in distress; I want help!" Binns followed this call by the position of the ship in latutude and longitude. Then, as now, when a radio operator hears the distress signal all else must stop until help is given, or until the situation is made thoroughly clear. Today the distress signal is SOS, but the meaning and procedure are the same.

On the night that Binns sent out the famous C Q D it was picked up not only by a number of ships, but by a little station at Siasconset, on Nantucket Island, Mass. Jack Irwin, the operator on watch there, received the call and immediately notified other ships of the appeal from the "Republic" and the position of the vessel. Help came quickly, and fifteen hundred lives were saved.

Parenthetically, it is interesting to note here that the same operator, Irwin, later had occasion to send the distress call and to receive the same much needed assistance which, a few years before he had been called to render. His radio appeal was sent from the ill-starred airship "America" which, under the pilotage of Vanniman and Wellman started on an air journey, but came to grief after having flown a thousand miles. The radio call for help was heard by the steamship "Trent," the vessel sped to the location given off the Bermudas, and picked up the crew of six men whose descent from the doomed gas bag had been effected by lowering a small lifeboat and setting it adrift by cutting the ropes.

The next dramatic part played by radio telegraphy came with the sinking of the steamship "Titanic," ten years ago. It so happened that I was then a wireless operator assigned to the Wanamaker station in New York. On the roof of the building a large plant had been installed for the purpose of sending messages between Philadelphia and New York, and also between other points.

It will be recalled that for a long time it was impossible to get definite information of what had happened on the ill-fated "Titanic." In those days we had no "loud-speakers," or any of the refinements of apparatus of the present day. Radio operators were required to wear headpieces with telephones clamped over the ears, in which the faint buzz of the dots

and dashes were heard. For three days and three nights, on a continuous stretch of seventy-two hours, I sat with the headpiece clamped on tightly, straining to hear a word or a detail that might come through the air.

Finally I was rewarded. I began to receive the first details of the disaster - the fact that the "Titanic" had sunk, that the Olympic had taken off a number of passengers. I immediately gave the news to the press. Then bedlam broke loose. Reporters and relatives and friends of passengers on the doomed liner hung breathlessly over my shoulder while I copied the names of those who had been saved, scanning every letter as I placed it on paper and hoping that the next word would spell the name of a loved one.

But the very tragedy of the "Titanic" disaster crystallized in the minds of everyone the value of radio, and the art was given a new status. One almost immediate result was the passing of laws of national and international character to safeguard life at sea by making it compulsory for every ship carrying fifty or more persons to be equipped with radio telegraph apparatus, with provision for two operators to be constantly on watch so that distress signals might be received or sent out in time of need.

For some little time thereafter the development of radio followed the activities of the sea; installations aboard ship multiplied and the coastal station system expanded. Message traffic from ship to shore was the principal function of a radio telegraph company, and the manufacture, operation, and maintenance of apparatus to give this service was practically its sole activity. A system of handling messages was developed, following the general practice of telegraphy, a procedure which remains virtually unchanged to this day.

Commercial Radio Traffic

An outline of the process may be of interest, for the question is often asked, "Just how is a message filed for transmission to or from a ship at sea?" It is not a complicated process.

The sender files the message for a vessel at sea at any telegraph office, giving the name of the passenger and the ship and marking the radiogram "Via RCA", if he desires the Radio Corporation of America to handle his message. The handling of the message then is as follows: It is telegraphed by landline to the nearest coastal radio station, which in turn calls the ship through the air, using the call letters which the Government assigns to each vessel as an identification. Operators on ships are required to listen for these messages. They acknowledge the call for their particular vessel and accept the message transmitted from the shore. If an answer is required, the ship calls by radio the three-letter designation of the coastal station wanted, transmits the reply which in turn is put on the telegraph wires directed to the person addressed, anywhere in the United States, or, for that matter, in any part of the world. **ER**

Editor's Note:

RCA reprinted this article in the form of a small booklet that they distributed for public relations. I found one of these booklets in Lee Faber's archives. After I read it and found it interesting I thought the readers of *ER* might enjoy it as well. Next month we'll print the remainder of the article.

THAT'S OBVIOUSLY A C— LOOK AT THE WAVEFORM

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Part 2

Wave-Lengths

There are two main points in this process which appear confusing to the lay mind. The first is, how does the ship operator know when he is to be called? The answer is that he does not; he listens; maintains a "watch," during which time it is his duty to be on the alert for signals intended for his ship; hearing his call, he answers, and the message is then forwarded. The second question is: How is interference, confusion of messages, avoided when several stations are working at the same time? This is a matter of tuning and wavelength; that is, the radio waves are of definite length just as the ripples from a stone made on water are of different length measured from peak to peak. Transmitters are adjusted to radiate a specified length of electro-magnetic wave, and the receiving instruments are also made selective, so as to receive as nearly as possible only the desired wavelength. International regulations govern the length of wave on which the various classes of messages are sent. For example, ship to shore traffic is generally conducted on 600 meters; the call for a ship or coastal station is made on that wavelength. If the air is not congested at that moment the message is then transmitted on that wavelength; but if it happens that several ships are working in the vicinity, to avoid interference, the operators, by agreement, shift to a band between 300 meters and 450 meters or a band of wavelengths above 1800 meters, also designated for this class of message traffic.

A great number of messages thus can be transmitted through the air at one time without causing interference or confusion. The generally used wavelength bands run from 200 meters, used by the amateurs, up to 20,000 meters, employed by commercial trans-oceanic stations. Control of the length of the radiated wave came in the early stages of the development of radio communication and this feature obviously has contributed largely to the rapid expansion of the present day system.

Trans-Oceanic Radio

The vastness of this system today is little appreciated by the general public. A score of nations in Europe and Asia are in regular radio telegraph communication with America and millions of words are exchanged in a straight commercial message business operated day and night.

A great network of high-power stations is required to maintain the world-wide system of the Radio Corporation of America; powerful transmitters are located in Massachusetts, Long Island, New Jersey, California and Hawaii. South America, too, will soon be adequately provided for, and already America is conceded the foremost position in the matter of commercial radio communication. The correspondent stations abroad are located in the important communication centers of Europe, Hawaii and in Japan.

In the accomplishment of the reliable trans-ocean service which prevails today, radio telegraphy has made some wonderful strides in technical development. The old time "spark" station has made way for a newer type, transmitting signals carried on a continuous wave, through which speed and accuracy have been increased and interference reduced to a minimum. This great improvement is largely due to the development of the Alexanderson alternator, a radio frequency machine which gives an output of 200 kilowatts, and which is produced by the General Electric Company. More than a dozen of these machines have been installed in American Stations.

Marked increase in the radiating efficiency of these transmitting stations has come, too, through improved design and application of the multiple tuned antenna. And of equal importance is the corresponding development of long-distance reception, whereby messages are now automatically transferred from the receiving station over land wires direct to a single office, located in the heart of New York's financial district, there to be recorded automatically at high speed in ink on paper tape by special recorders and transcribed on message blanks by operators.

By this method, elimination of the human relay at the receiving station has been effected, an obvious saving in time and an aid to accuracy. Of still more recent date is the new method devised by which two or more radio signals may simultaneously be transfered to the central operating office over a single wire, and the concurrent development of devices which make it possible to receive signals from four European stations on one receiving antenna without mutual interference.

Only a few "high spots" have been touched in the foregoing reference to the radio system existing at the present day; it includes, of course a commercial organization represented in principal cities by branch offices, and a messenger service adequate to take care of message traffic - a traffic which has grown within the past two years to something more than twenty per cent of the total business handled by seventeen cables connecting the old world with the new.

Radio Corporation of America

The Radio Corporation of America was formed as the result of an appeal from Government sources calling upon the patriotism and vision of the great electrical industries in the United States to establish an American-owned, operated, and controlled radio communication company, powerful enough to meet the competition of the radio interests of other nations and to develop the new art to the greatest possible service of the American people and the American Government.

The supreme inventive genius of the country, the greatest organizing ability, and the most powerful resources were placed at the service of the new art, with the result that radio has made greater strides in the past two years, than it had in the ten years previously. The Radio Corporation of America now enjoys the benefits of the highly developed manufacturing and research organizations of the General Electric Company, American Telephone & Telegraph Company, Western Electric Company, United Fruit Company, Wireless Specialty Apparatus Company and the Westinghouse Electric & Manufacturing Company together with its subsidiary, the International Radio Telegraph Company.

Broadcasting

The greatest feat of radio telegraph broadcasting, was the opening message sent from the Radio Central Station on Long Island, the super-power plant erected by the Radio Corporation of America. The station, the largest plant of its kind in the world, occupies about ten square miles of land, and when completed will cost about $10,000,000. It was built to send messages to a great many countries simultaneously. On November 5th last, it was officially opened to service by President Harding, who by pushing a button in Washington started the apparatus on Long Island and automatically sent out to the whole world a message of greeting from our nation's Chief Executive. That message was received simultaneously in twenty-eight different countries. It was received directly as far as New Zealand and Australia, Japan and in South America. It was a feat of broadcasting, that meant practically an instantaneous encircling of the globe with a single message. It was one of the crowning achievements of modern radio.

Turning to the discussion of the partially developed radio telephone, the basic principles are exactly the same as in

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radio telegraphy. With the radio telephone the voice control of the electro-magnetic wave is substituted for the telegraphic signal control; vacuum tubes replace the old time coil and coherer; but everything else remains the same in principle, except that in telephony, as stated, the wave is modulated or changed in accordance with the vibrations of the human voice, exactly as is the case with ordinary currents for wire telephoning.

Transmission of speech or music has been made possible almost entirely by development of that marvelous device, the vacuum tube. In physical appearance it resembles an ordinary electric light, but inside the glass bulb are three metallic elements, a plate, a filament, and a grid. A single one of these vacuum tubes, of fair size, can deliver as much high frequency power as would run an ordinary fan motor, or about one-sixteenth horse power. There are tubes now being made which generate a power of twenty kilowatts, or nearly thirty horse power.

What are the possibilities of radio telephony when the art will have developed to the approximate perfection of wireless telegraphy? It is difficult to keep one's feet on the ground in contemplating the subject. It staggers the imagination. Think of radio telephony as a means of better understanding between man and man, creed and creed, and even nation and nation.

On a recent Sunday, while I was at home, I listened to a sermon delivered by radio by Dr. Foster of Newark; it was a sermon on religion. His opening remarks, ran somewhat as follows: "I cannot address you as citizens of Newark, because my voice is being heard beyond the limits of the city. I cannot address you as fellow Americans, because my voice is being heard perhaps in Cuba, in Canada, and in Central America. I cannot address you as brethren of my faith, because only a very insignificant part of the great number who are listening to me are of my own faith. And therefore, I must address you as fellow human beings."

He struck a chord which, I am sure, was answered by every intelligent man or woman within the hearing of his voice, regardless of religious affiliation, regardless of nationality.

Consider that the great difference between man and animals is the fact that man can express himself, and that human beings have the ability to make others of their kind understand what they think and what they would like them to know. With the coming of the telegraph, man learned to transfer that power of expression to a telegraph operator, and thence to the wire. With the wire telephone, he found that he could himself send his message to a given point. And now with radio broadcasting he can radiate not only his message but his very personality; and that power is a very wonderful one.

To be concluded next issue.

Editor's Comments from page 1

My hope is that AM International becomes all that we want it to be and that it will endure for years to come. As I mentioned in a previous issue, I see the organization's most important role as a protector of AM; a group that can respond quickly and effectively to any FCC petition that might be threatening to AM.

But there are other roles a good organization could play as well. One would be to educate the rest of the amateur population regarding AM and to change the way AM'ers are perceived by the rest of the ham population. Brochures, slide shows and demonstrations at club meetings and hamfests would be very effective ways to do this.

AMI will have a continued presence in *ER*. I'll always have space for minutes of meetings, financial reports and bulletins to members. In the near future, when directors and executives have been nominated, I'll print the ballots in the magazine. I'm going to give all of my support to AMI. I think this organization is vital to the future of AM. **N6CSW/Ø**

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Part 3, the conclusion

An Internationalizing Agency

As an internationalizing agency, radio broadcasting is an instrumentality which, if properly used, may well break down prejudices, help men to understand each other, sway and even govern national and international motives by bringing the personality, the intelligence, and the thought of the world's great men to millions and hundreds of millions of people everywhere. It is right to think of this wonderful invention in terms removed from mere amusement; to conceive it as leading to something more than the hearing of a sound.

Radio communication of the future obviously tends to include all moving vehicles; it is already beyond the experimental stage for installations on ships at sea, submersibles, in aircraft, and railroad trains. It is reasonable to expect its eventual application to automobiles and even in some cases to individuals.

In a competitive sense, the future of radio is equally bright. Its opportunities in long distance communication are manifold, as evidenced in the single fact that messages can be sent through the air at tremendous speeds of transmission and, commercially, more words per minute mean less cost per word. With lessened cost, there will naturally be created new classes of service until the day may come when a business man will look upon the writing of a letter to Europe on an urgent subject as an archaic practice.

The practical vision of the future of radio does not include, however, the scrapping of undersea cable systems; radio will supplement, rather than supplant the cables. In the first place, experience has shown that new inventions usually result in the improvement of previously existing methods. In the second place, communication facilities always have been inadequate - just as new subways never quite relieve congestion - and the increase in facilities will cause increase in new services. It is inconceivable that the development of the transmission of intelligence will go forward at a leisurely pace; everything points to a very great acceleration. In putting an end to the single point-to-point limitation imposed upon the cable, radio will become the dominating method of conducting long distance communication and will hold that leadership.

In some measure, the same considerations apply to the future prospects of radio telephony over land. In the mobile services, in connecting up isolated communities, and the shore with the sea, there is a rich field for development. That radio will supplant the wire telephone is not to be contemplated. Wire telephone communication, as we know it today, has the greatest utility for the type of service rendered. It is a wonderfully developed and complete system for seeking out for the user, through a wire network and the central exchange personnel, the particular individual wanted. This entire system, this entire service, would have to be duplicated to establish radio telephony on a parity in usefulness; and even if this were technically practicable with radio telephony - which it is not - there is no economic justification for such duplication. The radio telephone, on the other hand, has a large sphere reserved for it in reaching locations where wires cannot be placed or maintained, in spanning inland

waters or connecting up islands off the coast. As a supplement to wire telephony alone, radio is assured of a great future - which again directs me to the subject of broadcasting, a field that distinctly belongs to radio.

The Future of Radio

To those of us who watched every step in the onward march of radio, who saw scientific principles shaping themselves into business facts, who sensed the trend of research in the development of wireless, the instantaneous success of radiophone broadcasting does not come as a surprise. In 1915, from the possibilities that could be foreseen I had worked out a plan for radio broadcasting in commercial detail, and submitted it for consideration by my Company.

The time was not ripe, however, for action on this project; we were in the midst of war activities and the devices for radiophone transmission and reception had not been perfected to the point to which they have been brought to at the present day. Broadcasting is a reality now, and it has been made possible only by fine co-ordinated effort within the industry, a large part of the credit being due to the Westinghouse Electric and Manufacturing Company for being first in establishing it on an organized basis. Radio telephone broadcasting is not in itself an invention; it is the application of principles previously established.

The hearth-side circle is only a small part of the unmeasured sphere of its influence, however. Country schools cannot afford to employ the best teachers or the most able lecturers. Think of a system of rural education, augmented through the setting up of a broadcasting station with a range of several hundred miles, and connecting up within that radius a thousand country schools. Appraise the benefit of having one skilled lecturer in history or geography, or hygiene, or whatever the subject may be, deliver his lesson as the children listen in their schoolrooms, possibly with the interspersing of appropriate items of entertainment and music to hold the children's interest.

And what may we expect when the telephone reaches across the ocean? Up to the present time there has been no way for trans-oceanic transmission of the human voice, because the cables lying on the bottom of the ocean are not suitable for speech transmission. They can carry feeble currents for telegraphy, but not for telephony, because of the distortion of the speech, and other technical reasons. But with the radio telephone, it may be predicted that within the next few years, and possibly sooner, we shall be talking across the Atlantic Ocean. It will be possible then for a man in New York to pick up his ordinary wire telephone, secure connection with the radio telephone station which will carry his voice across the ocean and connect up with his partner or business associate on the other side.

Trans-oceanic radio telephony is not a theory; it is an accomplished fact. Speech was first transmitted to France by the American Telephone and Telegraph Company; and even a greater distance was covered by its engineers when their equipment at the Arlington Naval Station, near Washington, enabled speech to be heard in Hawaii. This company and the associated engineers of the Western Electric Company have attained very practical results in their experimental work in the ship to shore field enabling me a few evenings ago to talk from my home, over the ordinary wire, to the Captain of the steamship "America," 400 miles out at sea. The highly developed ship radio telephone transmitter on the "America" was due to the General Electric Company.

Consider also one application of international broadcasting by radio; an international conference to make open covenants openly arrived at - and the whole world "listening in." Some day, and perhaps in the not very distant future the dream will be a reality. When it is possible for the peoples of the world to listen to the deliberations of statesmen, to have

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So the next time you're all talked out but still feel like some shack time, fire up that receiver and pop the bandswitch down to the broadcast band. You might be surprised at what you'll find.

For information on the National Radio Club write to : Ron Musco, PO Box 118, Poquonock, CT 06064-0118. The NRC also has a VERY informal ham net in the advanced portion of 75 meters Sunday nights year round.

(Author has been an editor with *DX News* for 25 years, holds an Extra Class amateur license, is a Volunteer Examineer liaison with ARRL and has been employed in broadcasting since 1957, a profession he was led into directly from his interest in BCB DXing. He is the proud owner of a restored Heathkit TX-1 and Johnson Valiant II and Adventurer in addition to his prized one-owner Hammarlund HQ-180A.)

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first hand knowledge of the functioning of their Executives in power, then the voice of the people may literally be heard.

Another vision of radio telephone utility was expressed to me recently by that eminent soldier-scientist, Major-General George O. Squier, Chief Signal Officer of the Army. Replying to my inquiry as to the reason for the number of devices installed in his office to bring in the etherwave concerts, he explained that this radio equipment served a dual purpose; in addition to the scientific interest it held for him, he employed it to create a mental background. For years he had noted that the concentration demanded by his daily duties was subject to the handicap of distractions caused by noises from the street outside. Radio could be employed to end all this, he believed, by bringing music into his office, enabling him to create his own background. By replacing noise with harmony, he would in time become oblivious of all outside sounds and work without injurious distractions. The basic thought here followed the experience of the Post Office in its installation of phonographs and the resultant speeding up of the work of men employed in sorting mail. The General carried the idea further, however, in asserting his conviction that the day was not far distant when radio broadcast receiving sets would attain a fixed position in certain classes of factory operations; more particularly could they be effectively introduced among the sweatshops to lighten the burden on the toilers subjected to the daily monotony there encountered.

The position of radio at the moment is a conspicuous one, not alone in the fact that it has suddenly caught the public fancy, but because the country wide buying movement of radio devices was begun in a period of business depression and the public's welcome to the new art brought needed stimulus to the great electrical industry. It will grow more conspicuous from day to day, with new uses and new developments. Thus, radio communication will be a force of vast and beneficial influence to civilization and humanity. **ER**

Letters from page 3

AM have radio did not enjoy this tremendous resurgence of interest by chance. It was through the tireless efforts of those who fought the anti-AM FCC dockets, printed publications, created organizations, and (last, but not least) the handful of us who never gave up for "almighty SSB", and continued to operate AM, even through the lean years of the early to mid-70's, when AM almost died!

We have finally established nice "AM windows" from 3870 to 3890, and around 3825 or 3830 kcs. Come on, fellas! Please! Either operate AM in the AM window or operate your SSB elsewhere! Please show the AM community a little consideration! Thank You.

Rick Miczak, K8MLV/Ø